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1. Introduction

A reduction of rural poverty and an alleviation of its debilitating consequences is a central political objective in many developing countries. In El Salvador, 42 percent of the population still lives in the rural areas, where the incidence of poverty is widespread: 54 percent of the poor are concentrated in those areas. Rural poverty is also deep (the income gaps between the rural poor and the rest of the population are wide), and poverty usually accompanies the degradation of soils and other natural resources (Hopkins, Southgate, and Gonzalez-Vega, 1999). To a large extent, rural poverty reflects the low productivity of labor in agriculture. This paper explores the implications of different degrees of household integration into the market on poverty levels in the rural areas of El Salvador. Policy implications are derived from the results.

After a decade of economic decline in the 1980s, El Salvador adopted major structural adjustment and macroeconomic stabilization strategies following the Peace Accords of 1992. As a result, between 1992 and 1997, in real terms GDP grew at an average rate above 5 percent per year. With rapid economic growth during the 1990s, poverty levels and income distribution significantly changed in El Salvador. Overall poverty rates substantially declined and income distribution became less dispersed.

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Poverty rates declined in both the urban and the rural areas, but the reduction was much slower in the rural areas. While this urban/rural differential reduction in poverty was observed in most Latin American countries, the gap was particularly wide in El Salvador (Morley, 1997, Siri, 1997). Between 1992 and 1997, urban poverty rates declined 14 percentage points, while rural poverty rates declined only 3 percentage points. In general, the ratio of average household incomes in the urban areas with respect to the rural areas increased from 1.9 in 1991/92 to 2.3 in 1997 (Lardé de Palomo, 1999). Large urban/rural differences in levels of education and differential access to economic opportunities through the market in the urban and the rural areas are important determinants of these results. This paper explores these topics from the perspective of the differential degrees of integration to markets of the Salvadoran rural households.

The central premise of this paper is that the opportunities to participate and the modalities of participation in several markets are among the most important determinants of the income levels and welfare of rural households. The division of labor and specialization that are allowed by greater integration to the market have long been recognized as key determinants of the rates of income growth. This has been historically possible through a reduction of transaction costs due to the development of means of transportation, communications, and financial intermediation as well as development of the institutional infrastructure that defines and protects property rights, allows the definition and enforcement of contracts, and facilitates transactions (North, 1990).

Integration to the market occurs when the gains in productivity from specialization and trade overcome the associated transaction costs (Yang and Borland, 1991). Rural households will participate in markets only when transaction costs become sufficiently low and the gains from access to market opportunities are sufficiently attractive. The action of the state is indispensable to induce reductions in transaction costs and to create the institutional infrastructure that allows and protects better productive opportunities.

The paper assumes that the household decides how to allocate the time of its working members among cultivation for self-consumption, production of crops and livestock products for the market, non-agricultural production for the market (microenterprises), and salaried work in agricultural and non-agricultural occupations.

The greater the orientation of this allocation of the household's labor supply towards the market, the higher household income will be. Rural households face, however, important barriers in their opportunities to participate in markets. High transaction costs of reaching the market places and of accessing opportunities in those markets offset potential gains from specialization and trade. Moreover, levels of education influence the productivity of household members and, thereby, potential wage and income levels. Low levels of income associated with low levels of education do not allow sufficient market-related earnings to overcome the existing transaction costs.

This paper reports results from the estimation of a model that attempts to capture the importance of transaction costs and education levels on differential degrees of integration to markets as well as the influence that these degrees of integration have on household incomes. First, the paper briefly discusses the data used in the estimation of the model. Next, the elements of a two-stage regression model are justified, the variables used are defined and measurement issues are addressed, and hypotheses are derived from theory and descriptive statistics of key variables. The econometric results strongly support the hypotheses, and the paper ends with some policy implications.

2. The Data

This study is part of the research agenda of the Collaborative Research Support Program on Broadening Access and Strengthening Input Market Systems (BASIS CRSP). The program has been sponsored by the Agency for International Development of the United States (USAID), and it is being implemented by the Rural Finance Program of The Ohio State University and the Salvadoran Foundation for Economic and Social Development (FUSADES) in El Salvador.

The data used in the estimation of the model presented here come from a survey of 626 rural households undertaken in early 1998, in order to document household activities during calendar year 1997 (Beneke de Sanfeliu, 2000). The 1998 observation is part of a panel data set on the same rural households, which have already been visited in 1996, 1998, and 2000. The survey is implemented to a nationally-based, stratified random sample of rural households, and the data are expected to represent the country's rural households at a confidence level of 10 percent.

A detailed questionnaire provides information on the socio-demographic features for all members of the household, sources and levels of employment and income, asset holdings, participation in land and financial markets, remittances, and many other dimensions of the household's economic activities. The resulting survey data are very robust.

3. The model

The main hypothesis to be tested is that low rural incomes are explained, in an important way, by the rural households' limited integration to commodity and factor markets and, thereby, by differential barriers to integration to markets. Indeed, different degrees of household integration to markets are influenced by:

(a) barriers to reaching the market place, which result in high transaction costs,

(b) the levels of education of household members in the labor force, which influence their ability to compete in labor and commodity markets, and

(c) the size of the plot of land that they cultivate, which influences their willingness to participate in the market.

A two-stage regression model is used to test these hypotheses. In the first stage, the household's *degree of integration* to the market is estimated as a function of the level of education of the household members in the labor force, an index of the household's location, and the per capita amount of the household's cultivated land.

In the second stage, the household's *per capita labor income* is estimated as a function of the *estimated* degree of household participation in the market, the number of hours actually worked per household member, an index of dependency, and the amount of non-labor income earned by the household.

The following equation was estimated for the first stage:

$$[INT] = \beta_0 [EDU]^{\beta 1} [LOC]^{\beta 2} [LAND]^{\beta 3} U \qquad (1)$$

where:

[INT] is an index of the degree of household participation in commodity and labor markets;

[EDU] is an index of the educational achievements of the household members in the labor force;

[LOC] is an index of the household's location;

[LAND] is the per capita amount of cultivated land, and

U is a random error with N (0,s).

For the estimation, the index of the degree of household participation in the market [INT] was measured in two alternative ways. This resulted in two sets of estimates for the parameters, depending on the measurement use. First, household participation in the market was measured as the number of hours worked for the market as a proportion of the total number of hours *actually* worked by the members of the household.

Second, household participation in the market was measured as the number of hours worked for the market as a proportion of the *potential* number of hours that the household members could have worked. The potential number of hours worked was computed by multiplying the number of household members actually employed times 44 hours a week, 52.14 weeks a year (these coefficients are considered in El Salvador to constitute a full-time work load).

An alternative method to compute the potential labor supply might have been to multiply 2,294 hours per year times the number of all household members in the ages of working (16-64 years old). This would have acknowledged that reductions of transaction costs that would allow greater integration to the market may lure some household members, presently not in the labor force, to look for employment. Higher labor productivity and household incomes may, however, also increase the demand for leisure or the demand for education and, thereby, may keep household members from joining the labor force.

Absence of sufficient information to evaluate the relative importance of these conflicting effects led the researchers to assume that any reduction in transaction costs and the accompanying emergence of better market opportunities would allow those already in the labor force to work longer hours, given their revealed desired to work. In contrast, it was assumed that such changes would not induce those not currently in the labor force to participate in the labor market.

That is, our current ignorance about the determinants of the rural households' labor force participation would justify the implicit assumption that the limited number of hours actually worked by those already in the labor force mostly reflected circumstances that constrain the demand for labor in the rural areas (*i.e., underemployment*). The

complementary assumption was that, for those who had not joined the labor force at all, not even within the household, circumstances regarding the supply rather than the demand of labor predominated.

The following equation was estimated for the second stage:

$$[Y/N] = \alpha_0 [INT]^{\wedge \alpha 1} [DEP]^{\alpha 2} [HOURS]^{\alpha 3} [OTHER]^{\alpha 4} V \qquad (2)$$

where:

[Y/N] is the household's per capita income from labor;

[INT]^ is the index of integration of the household to the market estimated in the first stage;

[DEP] is an index of dependency, measured as the number of dependents over the number of working household members;

[HOURS] is the number of hours worked per member of the household in the labor force;

[OTHER] is other non-labor per capita income, and

V is a random error with N(0,s).

The first stage generates the estimated value of the index of participation in the market as an *instrumental* variable that is then used as an explanatory variable in the second stage. Both the degree of integration to the market and the level of income of the household may be explained by the same factors (*i.e.*, they may result from the same decision process and constraints). The procedure used here avoids the problem that the index of participation in the market, used as an explanatory variable in the second stage, may then be highly correlated with the error term. This potential correlation is avoided because the estimator represents only the *deterministic* (explained) part of the variance in the index of integration to the market.

Indeed, given the values of the R-square to be reported, either 35 percent or 46 percent of the variance of this index (depending on the use of actual or potential total labor hours in the computation of the index) is explained by the regression estimated in the first stage. The explanatory variable used in the second stage does not include, therefore, the *stochastic* (unexplained) portion of the variance of the index of integration to the market, while it is this portion that may be correlated to the error term of the equation for the second stage.

Some observations of per capita household labor income earned in farm production were negative, which prevented the specification of a logarithmic functional

form. The exponential functional form for equation (1) and equation (2) was adopted to keep these values in the estimation and still generate coefficients that could be interpreted as elasticities. The outcome is a non-linear regression, which was estimated using a Gauss-Newton method. Two sets of coefficients were generated for the second stage as well, given the two alternative definitions of the index of integration to the market.

4. The Variables

The dependent variable used in the first stage was an index of household integration to the market, measured as the proportion of hours worked for the market with respect to the total number of hours (actually or potentially) worked. In turn, the total number of *hours worked for the market* was computed as the sum of:

(a) the number of hours worked in the household's own land to produce crops and livestock products for the market,

(b) the number of hours worked for wages in agricultural activities,

(c) the number of hours worked to earn non-agricultural wages, and

(d) the number of hours worked for the sale of non-agricultural products.

As a result of this computation, the index of integration to the market reflects the allocation of the household's employed labor time to either producing for the market or producing for self-consumption.

The number of hours worked in the household's own land to produce crops and livestock products for the market was not immediately available from the survey. A proxy for this variable was then created regarding its two components. For the first component, *i.e.*, the number of hours of household labor devoted to producing crops for the market, data on the total number of hours devoted to cultivating crops in the household's land, the amount of land (*manzanas*) cultivated with each particular crop, and the proportions of the output of each particular crop sold in the market or consumed at home were used as inputs for the estimation. These were the magnitudes actually available from the survey.

The number of labor hours devoted to each crop was obtained by using the proportions of the total area cultivated with each crop as weights. This method implicitly assumed that all crops required similar labor/land proportions. If crops produced for the

market required more labor-intensive practices, however, this method underestimated the proportion of labor time devoted to producing for the market.

In general, the degree of labor intensity is crop specific, but no information was available to differentiate across crops in this respect. The time devoted to each crop, estimated according to this method, was then multiplied times the proportion of the crop's output that was actually sold in the market or consumed at home. The addition of the amounts of time devoted to producing each crop for the market thus generated the total labor time spent by the household in producing crops for the market.

For the second component, *i.e.*, the number of hours of household time spent in raising animals and in producing livestock products, data on the total household time spent on livestock activities, the types of animals and derived products, and the proportions of each type of output sold in the market or consumed at home were used as inputs in the estimation. In this case, the proportions of each type of output sold in the market rather than consumed were used as weights in the estimation of the proportion of the total time spent on livestock activities that was directed to the market. The number of hours worked on the household land for the market was then obtained from the addition of the two components.

The annual number of hours worked for wages in agricultural activities, only for those periods when the household member was employed, was directly reported in the survey. This was also the case with respect to non-agricultural employment and with respect to the time spent in producing non-agricultural goods for the market.

On average, employed household members devoted 72 percent of their time to work for the market. This degree of integration to the market showed, however, a wide dispersion. At one extreme, 11 percent of these rural households did not participate in the market at all or devoted no more than 10 percent of their labor time to work for the market. At the other extreme, 40 percent of these households directed all of their labor efforts to the market. In between, 51 percent of these households spent some time in working for the market and some time in producing for self-consumption.

Table 1 compares features of these three classes of rural households. Households that are not integrated to the market are the poorest of the three categories. Their average per capita incomes are only 37 percent of the average incomes of households that are fully integrated to the market and 68 percent of the median per capita rural household

incomes. In turn, median per capita household incomes are only 66 percent of average household incomes, thus reflecting the skewness of the distribution towards lower incomes.

The average per capita incomes of households that combine some production for the market and some production for self-consumption are 83 percent of the average incomes of households fully integrated to the market. The average incomes of these partially integrated households are above the median for the rural population and are similar to the average for the population.

These differences in income appear to be correlated with potential explanatory variables of interest. Thus, the distance to the nearest paved road is longer (8.1 km.) for those households not integrated to the market than for those fully integrated (4.3 km.). This is reflected in the differences in the location index (to be defined) across these households. In general, fewer attractive productive opportunities exist in the proximity of those households not integrated to the market compared to those available to households that are fully integrated to the market.

Households not integrated to the market suffer more from underemployment than the others. These households work, both in their own land and as employees, fewer hours per year than fully integrated households do. Indeed, lacking integration to the market, their levels of employment are critically constrained by the size of their plots. As a result, on average the employed members of non-integrated households work only 89 percent of the number of hours worked by the members of fully integrated households. In turn, non-integrated households typically cultivate more land per member of the household than fully integrated households do (Table 1).

Not surprisingly, households not integrated to the market possess smaller endowments of human capital than households that are fully integrated to the market. While fully integrated households show, on average, 4.5 years of schooling of their members in the labor force, this average is only 2.3 years for households that are not integrated to the market.

5. The hypotheses

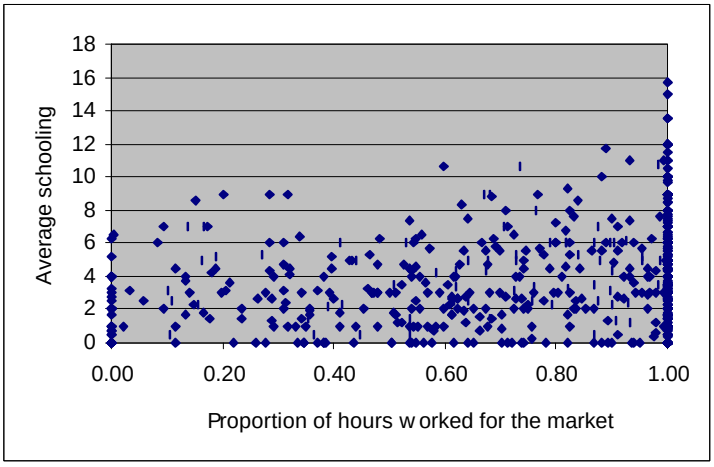
Both the conceptual framework and the results of Table 1 suggest a number of plausible hypotheses for testing. These hypotheses, some further description of the

variables, and predictions about the expected signs of the parameters in the estimation of equations (1) and (2) are discussed below.

A significant and positive sign is expected to reflect the influence of education on rural household participation in markets. Rural Salvadorans possess very low levels of education. On average, by 1997 schooling among the rural population amounted to less than three years (Ministerio de Economia, 1998). For the same year, 84 percent of the economically active rural population had not completed primary education. These low levels of schooling are reflected in the sample as well; on average, these households possessed 3.7 years of schooling. If the most distant households were missed by the survey, this average overestimates the levels of education of the rural population at large.

Graph 1

Proportion of the household´s total hours devoted to working for the market and average levels of schooling of household workers



A central hypothesis of this paper is that low levels of education lead to low degrees of participation in markets. On the one hand, poorly educated workers do not have the *credentials* required by some (the best) jobs in the market (Briones and Andrade-Eekhoff, 2000). On the other hand, low levels of labor productivity associated with low levels of education do not allow the sufficiently high incomes needed to overcome the transaction costs of participating in the market.

Thus, higher levels of education increase household participation in the market both from a supply of labor perspective (*i.e.*, through their influence on the net returns

from working for the market) and from a demand for labor perspective (*i.e.*, through the possession of credentials needed to aspire to certain jobs). Graph 1 shows the expected relationship between the levels of education of those household members who work and the proportion of the household's total hours devoted to working for the market.

Table No.1
Key indicators according to degrees of household integration to markets

	Median	Average			
		Total	Non-integrated[a]	Mixed[b]	Integrated[c]
Schooling of working members (years)	3.0	3.7	2.3	3.5	4.5
Per capita land holdings (manzanas)	0.08	0.5	0.8	0.6	0.1
Location (index = 100)	2.3	5.1	3.0	3.6	8.0
Distance to paved road (km.)	3.0	5.5	8.1	5.9	4.3
Annual hours worked per member[d]	1,608	1,708	1,409	1,610	1,925
Per capita household income from labor (colones)	2,540	3,851	1,717	3,829	4,597

a Devote no more than 10 percent of their time to working for the market.
b Combine working for the market and for self-consumption (11-99 percent).
c Work only for the market (100 percent).
d From a potential total of 2,294 hours.

Higher levels of education are needed in part to overcome the higher transaction costs due to the lack of proximity to market centers. Even though El Salvador is a very small country, transaction costs appear to be sufficiently high as to discourage market participation. Indeed, as a consequence of the poor condition of roads, the rural areas are comparatively isolated.

During the 12 years of the civil war (1980-1992), the rural infrastructure was completely neglected. After the Peace Accords, public investment has mostly focused on the Metropolitan Area. Thus, in 1998, while public investment in the Department of San Salvador was 509 colones per inhabitant, it was only 24 colones per inhabitant in the Department of Ahuachapan. As a result of this urban bias of public investment, the 6,656 kilometers of rural roads are not paved and, of these, 4,896 km. (73 percent) are not passable during the rainy season.

For the rural households in the survey, the average distance to the closest paved road is 5.5 km. (Table 1). Although this is a short distance by certain standards, on average it takes the members of a rural household 35 minutes to reach this road (*i.e.*, the average speed is less than 10 km. per hour). Once the paved road is reached, moreover, one must find a bus stop and wait for public transportation to arrive. As shown in Table 1, households not integrated to the market are further away from paved roads. One would thus expect a significant and negative relationship between distance and integration to the market.

Degrees of access to economic opportunities depend, however, both on distances to the places where those opportunities are located and on the volume of economic activity at those places. This is what the *location index* attempts to capture. In this study, the volume of economic opportunities is proxied by the potential number of jobs to be found in the 25 intermediate towns (peri-urban areas) and special industrial parks (*zonas francas*) in the proximity of these rural households. This index was computed on the basis of distances to towns with 50,000 inhabitants or more and distances to the main industrial parks.

The location index for each household is computed from the number of accessible jobs, which is defined as:

$$E = P_i L_i / (d_i + d_j) + N_i / (d_i + d_j) \qquad (3)$$

where:

E is the number of accessible jobs weighted by distance;

P_i is the population of the closest intermediate town (with 50,000 inhabitants or more);

L_i is the gross rate of labor force participation, computed as the number of employed people in the town divided by the total population of the town;

N_i is the number of jobs in a given industrial park within a 30 Km. radius from the residence of the household;

d_i is the distance from the household's residence to the closest post office (the most relevant piece of information available from the survey for this purpose), which is assumed to be located at the headquarters of a municipality (*cabecera municipal*), and

d_j is the distance from the corresponding municipal headquarters to the nearest town with 50,000 inhabitants or more or to the industrial park (Instituto Geografico Nacional).

This computation assumed that all of the employed in a given town reside in the same town, which may not be the case. Moreover, it was assumed that the gross rate of labor force participation measured by the 1992 Census was an appropriate approximation for the 1997 employment opportunities in each town. The spatial location of economic activity has changed much, however, since the Peace Accords.

The first term of equation (3) thus shows the number of (peri-urban) jobs to which the members of the rural household could have access, adjusted by distance, while the second term shows the number of industrial park jobs to which they could have access, also adjusted by distance.

The distance-adjusted number of accessible jobs for each household (E) was then compared to the number corresponding to the household with the greatest access, to construct an index of relative distance as:

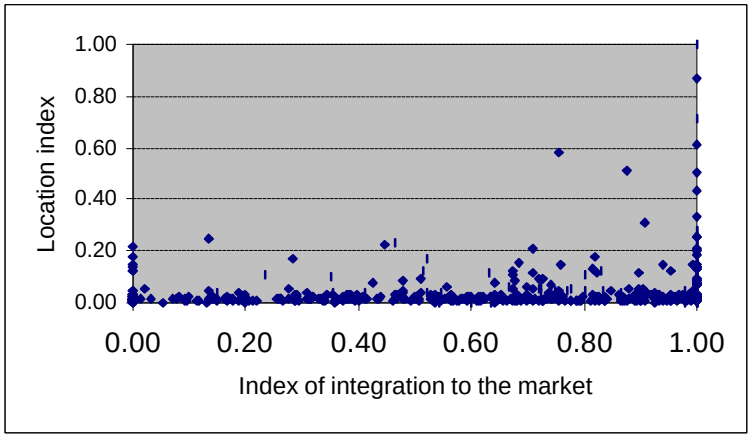
$$[LOC] = E_i/E_{max} \qquad (4)$$

where E_i is the number of accessible jobs for the particular household and E_{max} is the number of jobs accessible to the household with the maximum access. This index ranges between 0 and 1.

On average, the location index is a very low 0.05 for the rural households in the sample. That is, while a household with a location index equal to 1 has potential access to a market with 82,836 (peri-urban) and industrial park jobs, a household with the average index has potential access to a market with only 3,757 such non-agricultural jobs. Thus, non-agricultural employment opportunities in rural El Salvador are very limited. Through this effect, location positively influences degrees of household participation in the market. Households with better location indexes will participate more actively in labor markets. The strength of this relationship is reflected in Graph 2.

Graph 2

Integration to the market and location



Moreover, location not only influences access to labor market opportunities, but it also influences the transaction costs of selling crops and livestock products in the market. Given output prices, as transaction costs increase with distance, farmer profits decrease and incentives to participate in the market decline.

The relationship between the availability of land to cultivate (per capita) and degrees of household integration to the market is not as straightforward as those discussed above. It is clear that, for households without access to land, market participation is inevitable. That is, one would expect to observe high degrees of integration to the market when the available land is too scarce to sustain a family (although participation here may only mean becoming a landless peon).

At the other extreme, a household with an ample endowment of (per capita) land, large enough to generate a surplus beyond the output needed for self-consumption, will have incentives to at least sell this surplus in the market. Very large land endowments suggest, therefore, high degrees of participation in the market as well. Households with intermediate land endowments, in contrast, may prefer some degree of self-sufficiency, particularly if they are very risk averse and if transaction costs are high.

These considerations suggest the possibility of a U-shaped relationship between per capita land endowments and degrees of integration to the market. This lack of a monotonic relationship between these two variables prevents an unambiguous prediction about the sign to be expected from the corresponding coefficient.

Moreover, transaction costs are very important in determining participation in output markets. If the total costs are fairly independent of the volume traded (and more dependent on distance and time), the average (*i.e.*, transaction costs per colones traded or per unit of output) will decline with a larger volume of trade and profits will be castigated less by transaction costs. This means that those households with larger surpluses to trade (as a consequence of larger plots of land or of higher productivity) will find it easier to overcome the disincentive of high transaction costs. In contrast, households with small productive potential, because of limited access to land, will prefer to produce only for self-consumption, because they will not be able to overcome high transaction costs.

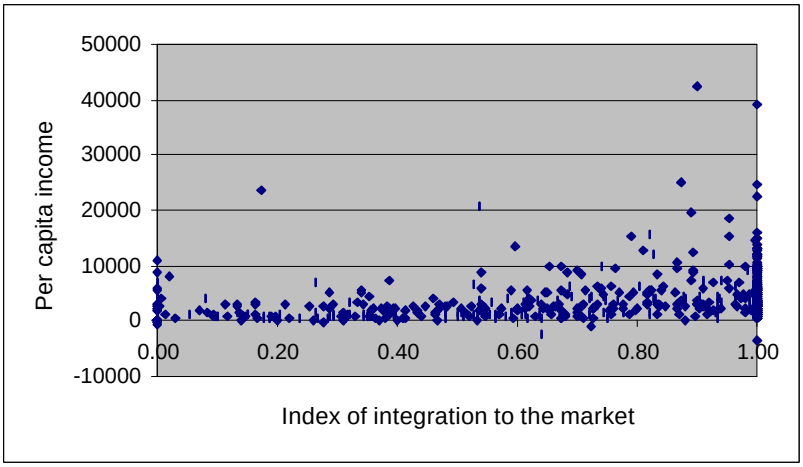
On average, rural households possess half-a-manzana of land per household member. For households not integrated to the market, this land endowment is 0.8 manzanas per household member. In contrast, fully integrated households possess only 0.1 manzanas of land per household member. These households are typically closer to urban centers.

The central hypothesis is that market integration significantly and positively influences household per capita incomes. As shown in Table 1, on average, in 1997 the annual income from labor (outside employment and self-employment) of the rural households in the sample amounted to 3,851 colones per household member (both workers and dependents). This is less than the per capita income needed to place them above the (relative) poverty line.

For 1997, for the rural areas, the extreme (absolute) poverty line was defined as 6.24 colones per day per person (2,278 colones per year) in contrast to 9.66 colones per day for the urban areas. This was assumed to be equivalent to the cost of one basic basket of food. The (relative) poverty line was set at two times the cost of the basic food basket. In the rural areas, this would be equivalent to 4,556 colones per person per year and, therefore, the poverty line would be above the average per capita rural income in the sample. It would also be, *a fortiori*, more than the median per capita labor income of only 2,540 colones per year, given the skewness of the distribution towards lower incomes.

Graph 3

Integration to the market and per capita income



Households with low degrees of integration to the market tend to earn lower per capita incomes compared to more integrated households, as shown in Graph. 3. Indeed, the average per capita labor income of households not integrated to the market (1,717 per year) places them below the absolute (extreme) poverty line.

If the only source of household income would have been labor-related income, 76 percent of the households not integrated to the market would have been in extreme poverty and 91 percent would have been in some form of (absolute or relative) poverty. Nevertheless, 38 percent of these households not integrated to the market received other income, mostly from domestic as well as international remittances from relatives.

Not all remittances go to poor households and not all of the poor households receive sufficient remittances to lift them out of poverty. Once this additional source of household income was taken into account, however, the proportion of those households not integrated to the market that are in extreme poverty declined to 62 percent and the proportion of these households that are in some form of poverty declined to 85 percent. Remittances were, therefore, a palliative of poverty for some, but not for all.

In turn, on average, fully integrated households earned per capita labor incomes of 4,597 colones per year. These incomes were 2.7 times higher than those of households not integrated to the market. These levels of income placed them above the poverty line. If the only source of income for these households would have been labor-related income,

however, still 30 percent of these households would have been in extreme poverty and 63 percent of them would have been in some form of poverty. While 27 percent of these households received other non-labor income, in this case, the additional sources of income contributed little to reduce the incidence of poverty. The proportion of these fully integrated households in extreme poverty declined to 27 percent and the proportion in some form of poverty declined to 60 percent as a consequence of these other sources of income, that is, reductions of only 3 percentage points.

Underemployment is widespread in the rural areas of El Salvador. In 1997, those members of the rural households who actually worked, on average, managed to work only 1,684 hours per year. This is equivalent to only 73 percent of the 44 hours per week considered to be a full time job.

Underemployment is more widespread among those households not integrated to the market. On average, the employed members of these households managed to work only 62 percent of the full-time equivalent. The median was even lower (49 percent of the full-time equivalent); that is, 50 percent of the employed members of these non-integrated households managed to work (in their own land and in outside jobs) less than one-half of the full-time equivalent. In part, the small size of their plots of land was a constraint on how much they managed to work; in part, the limited opportunities to find employment outside their own land was the other important constraint. Underemployment was, in any case, an important explanation of their low incomes.

In contrast, the employed members of fully integrated households, on average, managed to work 83 percent of the full-time equivalent. In this case, the median time worked is similar to the average time worked. This suggests a less skewed distribution of time worked for the integrated than for the non-integrated households.

6. Econometric results

The non-linear equation (1), which relates the index of integration to the market to levels of education, location, and land endowments, was estimated twice. The dependent variable for version A of the estimation was the proportion of hours worked for the market with respect to the total number of hours *actually* worked by the employed members of the household. The dependent variable for version B was the proportion of hours worked for the market with respect to the total number of hours that the employed

members of the household could have *potentially* work, in the absence of underemployment. This second version considers the likelihood that the number of hours worked for the market could increase, if transaction costs declined and market opportunities improved, without a reduction of the amount of effort devoted to production for self-consumption.

Table No. 2
Regression results of the index of integration to the market as a function of location, education of household workers, and per capita land holdings

Dependent variable: **Index of integration to the market**

	Equation A No. Observations = 610 F(4, 606) = 127.88 Prob > F=0.0000 R^2 = 0.46 adjusted R^2 = 0.45		**Equation B** No.Observations = 610 F(4, 606) = 80.69 Prob > F=0.0000 R^2 = 0.35 adjusted R^2 = 0.34	
Explanatory Variable	**Coefficient**	**t**	**Coefficient**	**t**
Index of location	0.11*	2.28	0.19*	3.67
Average schooling of workers	0.19*	2.41	0.32*	3.50
Per capita land holdings	0.00	0.00	0.00	0.00
Constant	0.61*	4.17	0.61*	3.95

* Significant for α = 5 percent.

The econometric results presented in Table 2 show that all coefficients are significant at the 5 percent level, except for the coefficient for the per capita amount of household land, which is not significant, as was expected. All the coefficients show the expected signs. Version A of the equation shows greater explanatory power (as reflected by an R-square of 0.46 and F = 128) than version B (R-square of 0.35 and F = 81). Both these results are very satisfactory.

If the results from version A are used, the elasticity of the household's integration to the market with respect to location is 0.11. That is, for each increment in the location index of 100 percent, participation in the market (as a proportion of hours actually worked) will increase 11 percent. The average index of location for the sample was 0.05. An increase in this index from 0.05 to 0.10 would increase participation in the market from the average of 72 percent of the working time of employed household members to 80 percent of their working time. This is a substantial effect, and the null hypothesis that

closer location to abundant sources of peri-urban employment does not increase participation in the market can be rejected.

Similarly, if the results from version A are used, the elasticity of the household's integration to the market with respect to education is 0.19. That is, for each increment of 100 percent in years of schooling, participation in the market (as a proportion of the hours actually worked) will increase 19 percent. An increase from 3.7 years to 7.4 years of schooling (for the average household) would increase participation from 72 percent to 86 percent of the time of employed household members. Again, this is a substantial effect, and the null hypothesis that higher levels of education do not increase participation in the market can be rejected.

As expected, the influence of land size per household member is ambiguous. In addition to the conceptual considerations that suggest the possibility of a U-shaped relationship, differences in the productivity of land across households that could not be measured may also influence this result.

Version B, in turn, generated equivalent econometric results, but the values of the coefficients (*i.e.*, the elasticities) are higher than for version A. The elasticity of integration to the market (as a proportion of the potential hours worked) with respect to location is 0.19 and the elasticity of integration to the market with respect to education is 0.32. On average, the employed members of rural households worked for the market 53 percent of their potential full-time equivalent. An increase in the location index from 0.05 to 0.10 would increase this rate of participation in the market to 63 percent. An increase in schooling from 3.7 to 7.4 years would increase this rate of participation in the market to 70 percent of the full-time equivalent. These are substantial effects.

Non-linear equation (2) relates per capita household income from labor to the estimate of the index of integration to the market from the first stage, the household's dependency rate, the number of hours worked per employed member of the household, and the per capita level of income from other non-labor sources. The equation was estimated twice, using the estimates of the index of integration to the market from versions A and B of the first stage.

The variable on other sources of income was included in the regression in an effort to ascertain if there is a substitution effect, such that these other non-labor related

sources of income discourage earnings of labor incomes by the household. This would be the case if the preference for leisure increases with the non-labor earnings.

Table No. 3
Regression results of per capita household income as a function of the index of integration to the market, dependency rates, the number of hours worked per employed member of the household, and per capita income from other sources

Dependent variable: **Per capita household income**

	Equation A No. Observations = 610 F(5, 605) = 27.11 Prob > F=0.0000 R^2 = 0.18 adjusted R^2 = 0.18		**Equation B** No. Observations = 610 F(5, 605) = 22.55 Prob > F=0.0000 R^2 = 0.18 adjusted R^2 = 0.17	
Explanatory Variable	**Coefficient**	**t**	**Coefficient**	**t**
Estimated index of integration to the market	1.44*	2.20	0.87*	2.18
Dependency rate	- 1.70*	-5.83	-1.71*	-5.73
Hours per household worker	1.37*	6.04	1.37*	6.02
Otros ingresos per cápita	0.20*	2.91	0.20*	2.74
Constant	0.54	0.58	0.24	0.57

* Significant for α = 5 percent.

The results from the second-stage estimation shown in Table 3 are very satisfactory as well. All coefficients are significant at the 5 percent level and the adjusted R-square is 0.18 (version A) and 0.17 (version B). Clearly, other variables beyond those considered here influence per capita incomes.

The econometric results reported in Table 3 reflect a very high elasticity of per capita income with respect to the integration to the market of the rural household. This elasticity is 1.44 for version A and 0.87 for version B. An increase of 10 percent of the index of integration into the market increases per capita incomes by 14.4 percent. Thus, for example, a 10-percent increase in the average degree of integration to the market, from 72 percent to 79 percent of the time actually worked by the employed members of the rural household, would increase average per capita incomes from 3,851 colones to 4,406 colones per year. This increase would lift the average household almost to the level of the (relative) poverty line of 4,556 colones.

Similarly, with the results from version B, an increase of 10 percent in the index of integration to the market increases per capita incomes by 8.7 percent. Thus, for

example, an increase in the average index of integration to the market from 53 percent to 58 percent would increase average per capita income from 3,851 colones to 4,186 colones per year. More active participation in the market substantially increases incomes.

Combining the results from the first and the second stages of the estimation, the predicted impact of any increases in the levels of education on per capita incomes is quite substantial. The elasticity of per capita household incomes with respect to levels of schooling is 0.27 (version A) or 0.28 (version B). This implies that an increase in average levels of schooling, from 3.7 years to 7.4 years, would increase per capita incomes from 3,851 colones to 4,929 colones per year, thereby lifting the average rural household above the (relative) poverty line.

Similarly, the combined results predict substantial impacts on income from reductions in transaction costs or any other measures that increase the availability of peri-urban and industrial park jobs in the rural areas. The elasticity of per capita incomes with respect to the index of location is 16 percent (version A) and 17 percent (version B). This implies that an increase in the average index of location from 0.05 to 0.10 would increase average per capita incomes from 3,851 colones to 4,506 colones per year.

At 1.37, the elasticity of per capita household income with respect to the number of hours worked is very high. An increase of the number of hours worked by the employed members of the household by 10 percent increases per capita incomes 13.7 percent. On average, the employed members of the rural household worked 73 percent of the full-time equivalent. If this were increased to 80 percent of the full-time equivalent, per capita incomes would increase to 5,276 colones per year, thereby lifting the average household well above the poverty line. This high elasticity is not surprising, and it mostly reflects the strong income-reducing effects of the widespread underemployment observed in the rural areas of El Salvador.

On average, each employed member of the rural household supports herself and two other dependents (the dependency ratio is close to three). The results from the regression analysis suggest that increases in the dependency rate reduce the household's per capita incomes. These results imply that a reduction of 50 percent in the dependency rate would increase per capita incomes 85 percent.

The positive sign of the coefficient for the variable other sources of income was not as expected. The results indicate that households with higher per capita incomes

from non-labor sources (mostly remittances) are also the households with higher per capita incomes from labor. That is, the null hypothesis that there is no substitution effect across sources of income cannot be rejected. The researchers do not have robust hypotheses to explain this result and further research will be needed.

These results confirm the findings of Jodhimani (1999), who used the same data set to test his hypotheses. He found a significant relationship between the proportion of household income generated through the market (as dependent variable), on the one hand, and the time spent in reaching the market, as a proxy for transaction costs (negative sign), the existence of sources of non-agricultural jobs within a 10 km. radius (positive sign), and an index of the household's educational achievements (positive sign), on the other.

7. Policy implications

This paper has shown that higher degrees of integration to markets increase the per capita incomes of rural households in El Salvador. The paper assumes that the traditional mechanisms of division of labor, specialization according to comparative advantages, and trade contribute to this result. In addition, integration to markets allows the rural household to overcome the underemployment of its labor force.

Important barriers constrain household integration to markets in rural El Salvador. Low levels of education are one of these barriers. The paper has shown that levels of schooling are significant in explaining degrees of integration to markets and that the corresponding elasticities are high. Educated household members understand better the opportunities offered by markets and possess the skills needed to take advantage of those opportunities. Higher levels of education also provide the credentials needed for access to better-paid non-agricultural jobs. Continued emphasis on improvements in rural education seems justified as a priority policy choice in view of these results.

Location also influences household access to productive and employment opportunities. Proximity to larger peri-urban and urban markets as well as industrial parks widens the household's set of opportunities. Despite small geographic distances in El Salvador, the time spent in reaching the market seems to be an important deterrent to integration. Given the poor conditions of the infrastructure, even small differences in distance can make a big difference. The importance of developing and maintaining rural roads is highlighted by these results.

The paucity of productive opportunities in agriculture is another source of concern. The reasons for the stagnation of agriculture in El Salvador are multiple and complex, ranging from overvalued real exchange rates, high reserve wages due to migration opportunities, constraints on profitable uses of land, and other circumstances.

In summary, if access to markets matters, the key role for the state in combating rural poverty will be the provision of the most basic public goods, which bring barriers to integration to markets down: education, health, physical infrastructure (rural roads and communications), information, legal frameworks, and the other elements of the institutional infrastructure needed for the smooth operation of markets. There has been a long historical delay in the provision of these basic public goods in the rural areas of many developing countries.

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